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From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

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Washington, DC 20231
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Applicant's or agent's file reference:

PA 3247 PCT/INT

International filing date:

10 December 1998 (10.12.98)

Priority date:

10 December 1997 (10.12.97)

Applicant:

WRIGHT, Wayne, Clifton, Augustus et al

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:

13 March 1999 (13.03.99)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PA 3247 PCT/INT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 98/03698	International filing date (day/month/year) 10/12/1998	(Earliest) Priority Date (day/month/year) 10/12/1997
Applicant PETROTECHNIK LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).
2. ☐ Unity of invention is lacking (see Box II).
3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ Transcribed by this Authority
4. With regard to the **title**,
 - ☐ the text is approved as submitted by the applicant
 - ☒ the text has been established by this Authority to read as follows:
CONNECTION BETWEEN A WALL AND A PIPE
5. With regard to the **abstract**,
 - ☐ the text is approved as submitted by the applicant
 - ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.
6. The figure of the **drawings** to be published with the abstract is:
 - Figure No. 13 ☐ as suggested by the applicant. ☐ None of the figures.
 - ☒ because the applicant failed to suggest a figure.
 - ☐ because this figure better characterizes the invention.

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Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A fitting for providing a substantially fluid-tight seal between an opening in a chamber wall (10) and a pipe (4) passing through said opening, said fitting comprising:-

- (i) a tabular sleeve (22) adapted to pass through the opening in the chamber wall (10) and further adapted to allow the pipe (4) to pass through the sleeve (22);
- (ii) a flange (24), extending radially outwardly from the sleeve (22), a first surface (26) of the flange (24) being configured to contact the chamber wall (10) around substantially the whole circumference of the opening; characterised in that the flange (24) incorporates an energy transfer means at or near the first surface (26), said energy transfer means enabling the first surface (26) and/or the wall of chamber (6) in the vicinity of the flange (24) to be heated to cause the flange (24) and the wall (10) to fuse or bond together in order to form a substantially fluid tight seal.

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INTERNATIONAL SEARCH REPORT

International Application No

T/GB 98/03698

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F16L47/02 F16L13/007

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 195 08 188 A (TROLINING GMBH) 12 September 1996 see the whole document	1-17
A	EP 0 190 810 A (DUROTAN ROR A S) 13 August 1986 see abstract	1-3



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

8 February 1999

Date of mailing of the international search report

15/02/1999

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

T/GB 98/03698

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 19508188	A	12-09-1996	AU 5103496 A	02-10-1996
			DE 19680126 D	11-12-1997
			WO 9628685 A	19-09-1996
			EP 0813666 A	29-12-1997
<hr/>				
EP 0190810	A	13-08-1986	DK 54986 A	09-08-1986
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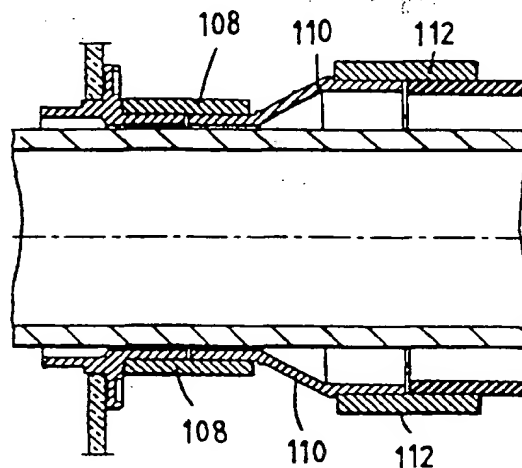
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: F16L 47/02, 13/007	A1	(11) International Publication Number: WO 99/30073 (43) International Publication Date: 17 June 1999 (17.06.99)
(21) International Application Number: PCT/GB98/03698 (22) International Filing Date: 10 December 1998 (10.12.98) (30) Priority Data: 9726154.9 10 December 1997 (10.12.97) GB (71) Applicant (for all designated States except US): PETROTECH- NIK LIMITED [GB/GB]; Maitland Road, Lion Barn Busi- ness Park, Needham Market, Ipswich, Suffolk IP6 8NZ (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): WRIGHT, Wayne, Clifton, Augustus [GB/GB]; Shekinah, 29 Cornwallis Avenue, Linton, Maidstone, Kent ME17 4BW (GB). BOUDRY, John, Alexandre [GB/GB]; Poplar Farm, Buxhall Road, Brettenham, Suffolk IP7 7PA (GB). (74) Agent: COATES, Ian, Harold; Sommerville & Rushton, 45 Grosvenor Road, St. Albans, Hertfordshire AL1 3AW (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: CONNECTION BETWEEN A WALL AND A PIPE



Secondary Containment Chamber
Connection of 160/110 and 160/90 Pipe

(57) Abstract

A fitting for providing a substantially fluid-tight seal between an opening in a chamber wall (10) and a pipe (4) passing through said opening, said fitting comprising: (i) a tabular sleeve (22) adapted to pass through the opening in the chamber wall (10) and further adapted to allow the pipe (4) to pass through the sleeve (22); (ii) a flange (24), extending radially outwardly from the sleeve (22), a first surface (26) of the flange (24) being configured to contact the chamber wall (10) around substantially the whole circumference of the opening; characterised in that the flange (24) incorporates an energy transfer means at or near the first surface (26), said energy transfer means enabling the first surface (26) and/or the wall of chamber (6) in the vicinity of the flange (24) to be heated to cause the flange (24) and the wall (10) to fuse or bond together in order to form a substantially fluid tight seal.

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CONNECTION BETWEEN A WALL AND A PIPE

Field of the Invention

This invention relates to fittings for providing a seal between a wall and a pipe passing through an opening in the wall, to a method of providing such a seal, and to an assembly comprising the combination of a pipe, a wall and a fitting providing a seal between the two. The invention is particularly applicable to the provision of a seal between a pipe and a wall of a manhole chamber as found in a subterranean fuel tank or sump for a dispensing pump, for example in a petroleum forecourt installation.

10

Background to the invention

In petroleum forecourt installations, pipework running between dispensing pumps and a subterranean fuel storage tank passes into a manhole chamber which is situated directly above the manhole lid of the tank. The chamber is normally defined by an upstanding wall which, when viewed from above, can be of an octagonal, square or rectangular shape, and which includes apertures through which respective pipes pass.

It is desirable to provide a seal between each of the apertures and its respective pipe to avoid ingress of water into the manhole chamber. To that end, it is known to attach a fitting to a portion of the wall around the aperture and a rubber "boot" that sleeves over the pipe and is clamped to both the pipe and the fitting by, for example, jubilee (TM) clips. Some types of fitting are bolted to the chamber wall, whilst other types of fitting provide inner and outer parts between which the wall is sandwiched, the inner and outer parts being held together by a screw-threaded connector which extends through the aperture. These connectors often incorporate a rubber seal located between a part of the connector and the chamber wall.

An example of a prior art seal is described in US5,538,035. This illustrates a flanged fitting for a subterranean tank. The flanged fitting is attached to the side of the tank by ultrasonic welding or a chemical bonding agent. Whilst heat sealing is referred to as a method of attachment, if heating is used then it must be applied
5 using an external source of heat.

Heat sealable connections are known per se. For example US5,601,315 describes a plastic moulded connector for connecting a plastic branch pipe onto a plastic pipeline, comprising a saddle portion and a pipe socket portion. Both the saddle and pipe portions contain electric heating windings. However, the
10 configuration of this coupling makes it entirely unsuitable for the present application.

Neither type of fitting provides a completely effective seal.

Consequently, both types of seal can allow water to leak into the manhole chamber and to accumulate in a pool in the bottom of the chamber. This in turn makes the maintenance of the chamber bottom and tank entrance extremely
15 difficult.

Furthermore, it has been found that the removal and replacement of the rubber seals of conventional arrangements can also be extremely difficult and expensive.

It is an object of the present invention to provide a fitting which overcomes
20 some or all of the above disadvantages.

Summary of the Invention

According to a first aspect of the present invention, there is provided a fitting for providing a substantially fluid-tight seal between an opening in a chamber wall
25 and a pipe passing through said opening, said fitting comprising:-

- (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;

characterised in that the flange incorporates an energy transfer means at or near the first surface, said energy transfer means enabling the first surface and/or the wall of the chamber in the vicinity of the flange to be heated to cause the flange and the wall to fuse or bond together in order to form a substantially fluid tight seal.

It is believed that water which leaks through conventional fittings and seals does not pass between the sealing member, for example the rubber gasket seal, and the pipe, but instead passes between the fitting and the wall. By contrast, the present invention provides a fitting which, when installed, is sealed to the wall around the aperture, and which does not require attachment to the wall by any invasive method, for example bolts, which would require further apertures in the wall. Thus, a seal formed using a fitting in accordance with the present invention should be substantially watertight or at least far more effective than the seals provided by conventional fittings.

Preferably, the first surface comprises a fusible material, such as a thermoplastic (for example polyethylene) which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.

Preferably, the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the surface.

The process by which two components are fused together as a result of electrical heating from a conductor (situated at or near the interface between the two components prior to fusing) is known as electrofusion. Electrofusion is normally used to provide seals at the join between two lengths of pipe, (particularly polyethylene pipe) in a pipeline. The same process can be used by a fitting in accordance with the present invention if the wall to which the fitting is to be fused is of a suitable thermoplastic material, such as polyethylene.

It is however possible for the fitting to be required for a wall which is of a material, for example fibreglass, which is not suitable for being attached to the fitting by electrofusion. In this case, therefore, the first surface of the fitting preferably comprises an adhesive which is of a type which is activated by heat, wherein the heating of the surface by the energy transfer means activates the adhesive and thereby bonds the fitting to the wall. The adhesive can be a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive of a type known per se.

This type of fitting can be attached to a wall by a procedure similar to that used by the fitting which is bonded to a wall by electrofusion.

Preferably, the conduction means comprises a heating wire which is conveniently embedded within the surface. The surface may to advantage be part of a flange which extends from the sleeve. Where the sleeve is of a substantially circularly symmetric cross-section, the flange is preferably radial.

If the energy transfer means comprises conduction means, the fitting preferably includes terminals, for connecting the conduction means to a current supply, which are accessible from the opposite side of the flange from the surface.

According to a second aspect of the invention, there is provided a fitting in accordance with the first aspect of the invention and a sealing member for sealing

the sleeve of the fitting to a pipe passing therethrough. The sealing member may be incorporated into the sleeve, or may be formed as an initially separate fitting which is subsequently attached to the sleeve after the fitting has been installed.

Preferably, the sealing member is resilient, and there is provided clamping
5 means (such as jubilee clips) for clamping the sealing member to the pipe and/or the sleeve. Conveniently, the sealing member comprises a rubber sleeve.

According to a third aspect of the invention, there is provided a method of providing a seal between a pipe and a wall having an opening through which the pipe passes, the method comprising the steps of applying a fitting to the pipe, the
10 fitting having a sleeve through which the pipe passes and a surface which is placed against a portion of the wall around the opening so as to surround the latter; heating the surface and/or said portion of the wall thereby to cause the wall and the surface, and hence the fitting to become fused or bonded together, and sealing the sleeve to the pipe before, during or after said heating step.

15 Preferably, said heating is achieved by passing an electric current through conduction means in the vicinity of the portion of the wall and the surface. The conduction means may be provided on the wall, but is preferably carried by the surface of the fitting.

Conveniently, the materials constituting the wall and the surface are such
20 that the surfaces are fused together by a process of electrofusion.

Where other materials are used, however, the method also includes providing an adhesive which is activated by said energy transfer to cause the fitting to be bonded to the wall. The adhesive may form the surface of the fitting. Additionally or alternatively, the adhesive may be provided on the wall of the
25 chamber.

Preferably, the wall comprises a manhole chamber wall for a subterranean fuel tank.

The invention also lies in a manhole chamber for a subterranean fuel tank, a pipe which passes through an aperture in the wall of the chamber, a fitting having a sleeve through which the pipe passes, the fitting being placed against the wall so as to surround the aperture, energy transfer means for heating the fitting and/or the
5 chamber to cause the fitting and/or chamber to be fused or bonded together in a region which surrounds the aperture, and a sealing member for sealing the pipe to the sleeve.

Brief Description of the Drawings

10 The invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a partially cut-away side view of part of a petroleum forecourt installation which includes a tank having a manhole chamber, having a fitting in accordance with the invention;

15 Figure 2 is a cut-away side elevation, to an enlarged scale, showing the fitting in position on the manhole chamber wall;

Figure 3 is a front elevational view of the fitting (prior to installation); and

Figures 4 and 5 are sectional side views of two further embodiments of fittings in accordance with the invention, each drawing showing the fitting when installed;

20 Figures 6, 7, 8 and 9 show sectional side views and end elevations of further embodiments;

Figures 10, 11, 12 and 13 show sectional side views of various fittings showing tolerances for pipes not aligned perpendicular to the chamber wall;

Figure 12 shows a typical and elevation for such fittings;

25 Figures 13, 14 and 15 show fittings according to the present invention in use with conventional pipe electrofusion seals;

Figures 16 to 22 show various other configurations of fittings;

Figures 23 and 24 show perspective views of a preferred embodiment;

Definitions

- 5 In this context the following terms have the meanings given below in addition to their ordinary dictionary meanings:-

chamber – any receptacle designed to keep a fluid in or out. This includes, but is not limited to manhole and sump chambers as described herein. It also includes tanks in general.

- 10 **energy transfer means** – a generic term describing any form of energy source. Typically it takes the form of a resistance winding which heats up when an electrical current is passed through it. The term also encompasses other welding techniques including ultrasonic welding and induction welding.

- 15 **flange** – any collar suitable for attaching a fitting to a chamber wall. In the examples given the surface of the flange which contacts the chamber wall is substantially planar. However, it will be understood that the flange must conform to the profile of the chamber wall around the pipe inlet opening. Thus the flange can adopt any suitable conformation to achieve the necessary contact with a flat or curved surface or even the corner of a container wall.

- 20 **fluid** – whilst the examples provided relate mainly to liquids, the term fluid refers to liquids, vapours and gases. For example, should a leak occur in a secondarily contained pipe in a garage forecourt installation then petrol or petrol vapour will collect in the manhole chamber. It is essential that this petrol vapour cannot escape through the wall of the chamber and into the surrounding ground.

- 25 **pipe** – the examples given herein are for a generally circular cross-sectioned single wall pipe. However, the invention also covers other cross-sections such as box

sections, corrugated and the like and secondarily contained pipes of the "pipe-within-a-pipe" type. In this case the sealing member or boot for sealing the sleeve to the pipe will be rather more complex. However, such boots are well known in the art.

5 The invention also encompasses pipes which are not circular in cross-section.

tubular sleeve - this term has a very broad meaning. It includes any projection from the flange which substantially encircles a pipe passing through the fitting and which enables a seal to be made between the fitting and the pipe. The flange and
10 sleeve need not be of unitary construction and the two-part threaded construction shown in Figure 4 offers certain advantages.

Description of the Preferred Embodiments

The present embodiments represent currently the best ways known to the
15 applicant of putting the invention into practice. But they are not the only ways in which this can be achieved. They are illustrated, and they will now be described, by way of example only.

The petroleum forecourt installation shown in Figure 1 comprises a pair of dispensing pumps 1 and 2 connected to a subterranean tank 3 through a pipeline 4.
20 The pipeline 4 is formed from contiguously arranged sections of polyethylene pipe. The pipeline 4 extends from the pumps 1 and 2 into a manhole chamber 6 immediately above the tank 3. The chamber 6 is defined by a polyethylene member 8 having a side wall 10 and a base 12.

Figure 1 shows two lines extending from the pipeline 4 into the tank 3.
25 These lines relate to two alternative forms of fuel supply system and are both shown for the sake of completeness. In practice, only one of the lines would extend from

the pipeline 4 into the manhole chamber 6. One of those lines is a suction line 14 which is used where the dispensing pumps and 2 are fitted with suction pumps. The alternative line, reference 16, is a pressure line connected to the pipeline 4 via a pump 18 which is operable to propel fuel from the tank 3 to the pumps 1 and 2.

5 It can be seen from Figure 1 that the wall 10 has to be apertured in order to allow the pipeline 4 to pass into the chamber 6. In order to prevent water leaking from the surrounding ground (here denoted by reference numeral 20) into the chamber 6 through the aperture, the pipe is sealed to the cylindrical wall 10 by means of a fitting 22 shown in more detail in Figures 2 to 5.

10 The fitting comprises a cylindrical sleeve 22 having an outwardly projecting radial flange 24 towards one end. The flange and sleeve define a central passage through which the pipe of the pipeline 4 extends. It can also be seen from Figure 2 that the sleeve extends through the aperture in the wall 10 50 that the sleeve is at least partially accommodated within the chamber 6, whilst the flange 24 is situated
15 outside the chamber.

 The flange 24 has a surface 26 which is flat, to enable the surface to be placed against the wall 10 as shown in Figure 2. Accordingly, the flange 24 makes contact with the wall 10 in a region which surrounds the opening through which the pipe 4 passes. A wire 28 is embedded in the surface 26 in a generally spiral shape
20 as shown in Figure 3, and the ends of the wire 28 are connected to electric terminals 30 and 32.

 The sleeve 22 is also adapted to receive a rubber boot 34 which is clamped at one end over the sleeve by a jubilee clip 36. The opposite end of the boot 34 is clamped onto the pipe of the pipeline 4 by a jubilee clip 38.

25 When the fitting (constituted by the sleeve 22 and flange 24) is installed, the flange 24 is initially pressed against the wall 10 and the terminals 30 and 32

connected to a source of electric current. The current passes through the wire 28, causing the latter to heat the adjacent surface of the flange 24 (and part of the tank 10), to cause the flange 24 and wall 10 to fuse together in a disc-shaped region which surrounds the opening in the tank 10. This not only retains the fitting on the
5 wall 10 but also provides a seal which encircles the opening in the tank, and thus prevents water passing between the flange and the wall 10 through the opening of the latter into the chamber 6. The passage of any water which travels along the surface of the part of the pipe outside the chamber 6 will be blocked by the boot seal 34.

10 If the chamber wall were to be made of fibreglass, a modified version of fitting would be used. The modified version is identical to the version shown in Figures 2 and 3, apart from the inclusion of a layer of adhesive over the surface of the flange which would constitute the surface 26 on the flange 24 and which overlies the heating wire. The adhesive is a thermoplastic or cross-linking adhesive which
15 once heated, forms a bond between the flange 24 and the wall 10. Again, since the bond will surround the opening in the wall 10, it also acts as a liquid tight seal to prevent the ingress of water.

It will be appreciated that various modifications to the fitting and/or chamber wall are possible within the scope of the invention. Thus, for example, the wire 28
20 could be embedded in the chamber wall 10, and the latter could carry the adhesive coating instead of, or in addition to, the fitting 24.

Figures 4 and 5 show alternative forms of fitting when installed on the chamber wall 10.

The fitting shown in Figure 4 has an outer circular back plate 40 which is
25 formed as a radial flange on a sleeve 42, and which carries a spiral winding of a wire 44 connectable to an electric current source by means of terminals 46 and 48.

The flange 40 and sleeve 42 are formed of a thermoplastics material which can be fused to the (thermoplastic) wall 10 in a similar fashion to the fitting shown in Figure 2.

Alternatively, either the flange 40 or wall 10 can carry a heat-activated
5 adhesive if the wall 10 is of a material not suitable for electrofusion welding.

The outer surface of the sleeve 42 carries a screw-threaded portion which enables the sleeve, and hence the flange, to be screwed onto an outer sleeve 50 from which a further radial flange 52 projects. The inner flange 52 is pressed against the inside of the wall 10, and includes a circular groove which
10 accommodates an O-ring seal 54 for preventing the ingress of any water which manages to breach the seal between the flange 40 and outside of the wall 10.

The sleeve 50 carries a rubber boot 56, clamped to the sleeve by a jubilee clip 58. The boot is also clamped to the pipe of the pipeline 4 by a jubilee clip 60, and serves a similar purpose to that of the boot 34.

15 As the outside of the fitting (i.e. flange 40 and sleeve 42) is securely bonded/fused to the wall 10, the removal of the sleeve 50 (and flange 52) for repair or maintenance can be readily done without the need to have any access to the exterior of the wall 10.

Figure 5 shows the same fitting when modified to accept a pipeline which
20 uses secondary containment (in which fuel is conveyed along an inner fuel supply pipe 62 which extends through an outer, secondary pipe 64). It can be seen that the only modification to the fitting is to the boot seal, and associated jubilee clips which are now arranged to provide a seal between the fitting and both the pipes 64 and 62 (three jubilee clips 60, 60' and 58 are used to that end). It can be seen that the boot
25 56 is also configured to accommodate part of a leak detection sensor for detecting any leaks of fuel from the inner pipe 62 into the interstitial space between the pipes 62 and 64.

A similar arrangement of fittings to those shown in Figures 2, 4 or 5 are used to seal the pipeline 4 to each of a pair of sumps 68 and 70 (which are rectangular in plan) beneath the pumps 1 and 2 respectively. A respective fitting is installed on the sumps 68 and 70 about each aperture (in the sumps) through which the pipeline 4 passes.

Figures 6, 7, 8 and 9 shown embodiments of the present invention which are adapted to allow a degree of misalignment of the pipe as it enters through the chamber wall. The inside surface of the sleeve 72 is chamfered out towards the outer surfaces of the fitting. That is to say, the internal diameter of the sleeve is smallest at its central point, or thereabouts, and the inner diameter of the sleeve increases as one traverses the longitudinal axis of the fitting, in either direction. In practice, it is as if the fitting was constructed from two shallow frustoconical portions welded together, narrower point to narrower point. The substantially narrowest point is at 74.

The flexibility of this arrangement is shown in figures 10, 11 and 12. In these cases provision for a 10° misalignment either side of perpendicular is provided for. However, by careful design this angle can be increased as desires.

Enlargements in Figures 6 and 8 show how provision can be made to secure a rubber boot in place over the inner part of the sleeves 76 and 86 which extend into the chamber. A protrusion or enlarged lip 80, 90 extends around the external circumference of the sleeve. This enables a rubber boot to be clamped securely around the sleeve as required.

Important features of the invention are shown in Figures 10, 11 and 12. These illustrate how it is possible to extend the sleeve from both sides of the chamber wall for maximum flexibility and also to allow for attachment of the fitting inside as well as outside the chamber. These designs share many common

features. Referring to Figure 10, this illustrates a sleeve 92 which extends in use both inside and outside the chamber wall. The chamber wall is not shown in this Figure but would locate generally at 94 and but up to the flange 96.

The surface of flange 96 has embedded into it a heating element 98. The shape and dimensions of the sleeve can be adjusted such that it only extends into the chamber. This is shown as Option 1 in Figure 11. Alternatively, a degree of symmetry about the flange can be provided such that the boot can be welded either on the inside or the outside of the chamber wall. This is shown in Option 2 of Figure 11. In this case a substantially similar portion of sleeve 102, 104 suitable for attachment to a rubber boot, extends on either side of the flange.

It is also possible to adapt these fixings for use with conventional electrofusion pipe welding sockets. An example of this is illustrated in Figure 11 Option 3. In this case a portion of the sleeve 106 extends outwards from the chamber wall in use to act as a termination for a secondary containment pipe. A suitable termination is a Wavi Duo PN4 socket from PetroTechnik Ltd.

The fitting of Option 3 will allow for some misalignment of the pipe. However, when secondary containment is used there should be no misalignment of the primary pipe.

This is just one way of terminating any secondary containment system. It is equally possible to use the types of termination shown in Figures 13, 14 and 15 which illustrate different arrangements for different pipe diameters. Pipe jointing components 108 to 124 inclusive, of a type known per se, can be used to couple and/or terminate secondary pipes. This greatly increases the flexibility of this type of fitting.

Perspective views of a fitting according to the present invention are shown in Figures 23 and 24. These illustrate a flange 130 extending radially outwardly from a

sleeve 132. The sleeve extends on both sides of the flange. A raised rim 134 extends around the outer circumference of each end of the sleeve. Electrical terminals 136 and 138 allow current to be connected to a heating wire embedded in the surface of the flange adapted to engage with the chamber wall.

- 5 Fittings according to the present invention can be formed from any suitable material as selected by the materials specialist. Preferably the fittings are formed from a thermoplastic material such as polyethylene. In a particularly preferred embodiment they are formed as a single unit by turning or casting.

- Methods of laying a wire into a flat surface are known, for example by
10 Rutland Plastics Ltd, and can be applied here without substantial modification.

 The present invention also encompasses a method of fixing a pipe to a chamber wall as described above and the combination of apparatus that results from operating said method.

15

Claims

1. A fitting for providing a substantially fluid-tight seal between an opening in a chamber wall and a pipe passing through said opening, said fitting comprising:-
- 5 (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;
- 10 characterised in that the flange incorporates an energy transfer means at or near the first surface, said energy transfer means enabling the first surface and/or the wall of the chamber in the vicinity of the flange to be heated to cause the flange and the wall to fuse or bond together in order to form a substantially fluid tight seal.
2. A fitting according to Claim 1, in which the first surface comprises a fusible
- 15 material which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.
3. A fitting according to either Claim 1 or claim 2, in which the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the
- 20 surface.
4. A fitting according to Claim 1 or Claim 3, in which the fitting is adapted for use with a wall which is of a material which is not suitable for being attached to the fitting by electrofusion, the first surface of the fitting incorporating an adhesive of a type which is activated by heat, wherein the heating of the surface by the energy
- 25 transfer means activates the adhesive and thereby bonds the fitting to the wall.

5. A fitting according to Claim 4, in which the adhesive is selected from a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive.
6. A fitting according to any of Claims 3 to 5 inclusive, in which the conduction means comprises a heating wire which is embedded within the first surface.
- 5 7. A fitting according to any preceding claim, in which the sleeve is of a substantially circular cross-section, and the flange is radial.
8. A fitting according to Claim 3 or Claim 6, in which the fitting includes terminals for connecting the conduction means to a current supply.
9. A fitting according to any preceding claim wherein the fitting further
10 comprises a sealing member or boot adapted to form a fluid tight seal between the sleeve and the pipe.
10. A fitting and sealing member according to Claim 9, in which the sealing member is resilient, and there is provided clamping means for clamping the sealing member to the pipe and/or the sleeve.
- 15 11. A fitting according to any preceding claim modified in that the energy transfer means is incorporated into the wall of chamber in the region directly beneath the flange.
12. A method of forming a seal between an opening in a chamber wall and a pipe passing through said opening, the method comprising the steps of:-
- 20 (a) applying a fitting to the pipe, said fitting comprising a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve; a flange extending radially outwardly from the sleeve, a first surface of the flange being configured to contact substantially the whole
25 circumference of the flange, the flange incorporating an energy transfer means at or near the first surface;

- (b) applying energy to the energy transfer means and thereby heating the first surface and/or the portion of the wall of the chamber in the vicinity of the flange to cause the fitting to become fused or bonded to the chamber wall in a fluid tight manner;
- 5 (c) applying a sealing member or boot to form a fluid tight seal between the sleeve and the pipe.

13. A method according to Claim 12, in which said heating is achieved by passing an electric current through conduction means in the vicinity of the portion of the wall and the first surface.

- 10 14. A method according to Claim 13, in which conduction is carried by the first surface.

15. A method according to either Claim 13 or Claim 14, in which the materials constituting the wall and the surface are such that the surfaces are fused together by a process of electrofusion.

- 15 16. A method according to Claim 13 or claim 14, in which the method also includes providing an adhesive on the first surface which is activated by said heating to cause the fitting to be bonded to the wall.

17. A method according to Claim 16, in which the adhesive is incorporated into the first surface on the flange.

- 20 18. A method according to any of Claims 13 to 17, in which the wall comprises a manhole chamber wall for a subterranean fuel tank.

19. An assembly comprising a combination of a manhole chamber for a subterranean fuel tank, a pipe which passes through an aperture in the wall of the chamber, a fitting having a sleeve through which the pipe passes, the fitting being
25 placed against the wall so as to surround the aperture, energy transfer means for heating the fitting and/or the chamber to cause the fitting and/or chamber wall to be

fused or bonded together in a region which surrounds the aperture, and a sealing member for sealing the pipe to the sleeve.

20. A fitting substantially as described herein with reference to, and as illustrated in, any combination of the accompanying drawings numbers 2 to inclusive.

5 21. A method substantially as described herein with reference to any combination of the accompanying drawings.

1 / 9

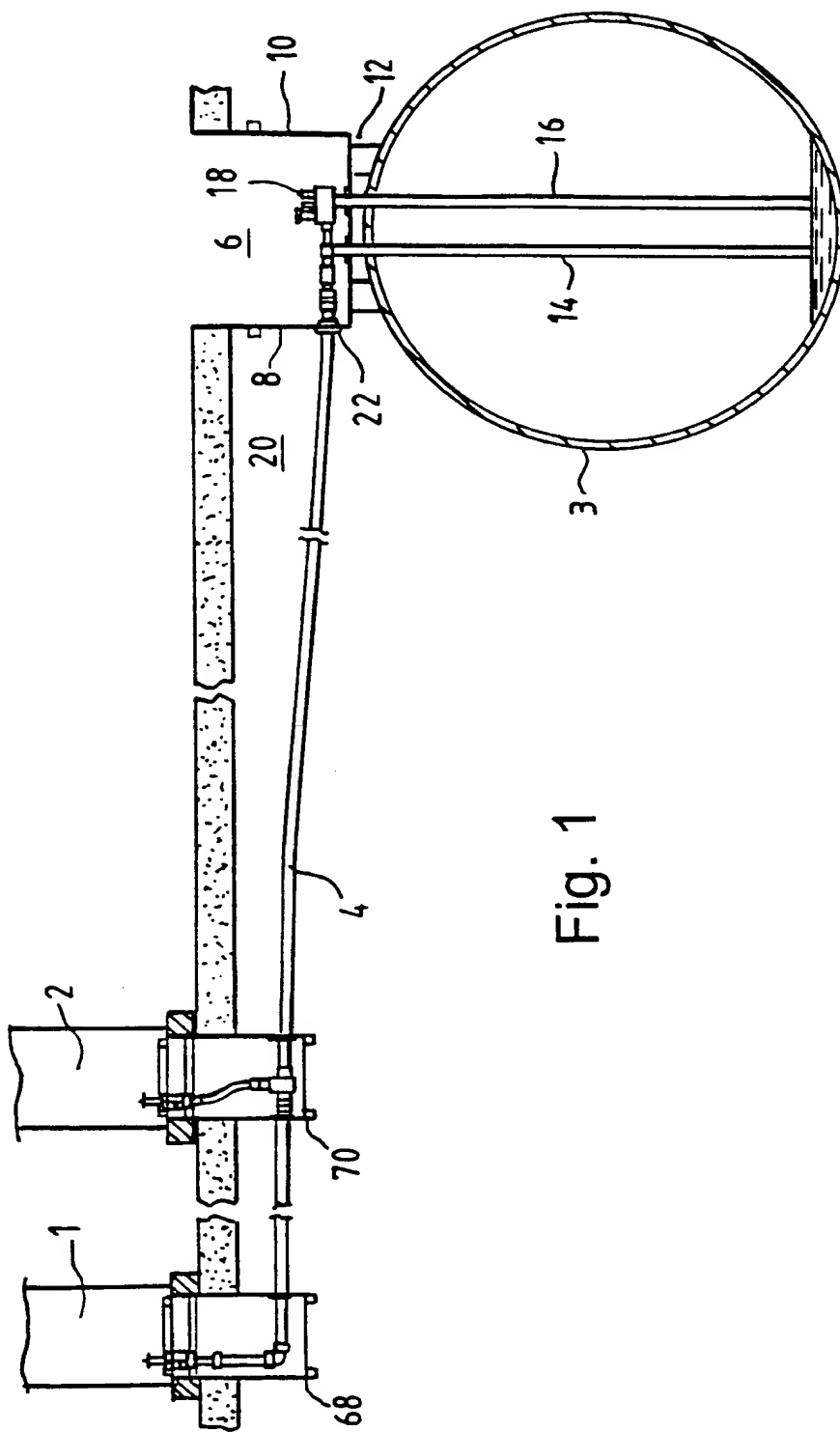


Fig. 1

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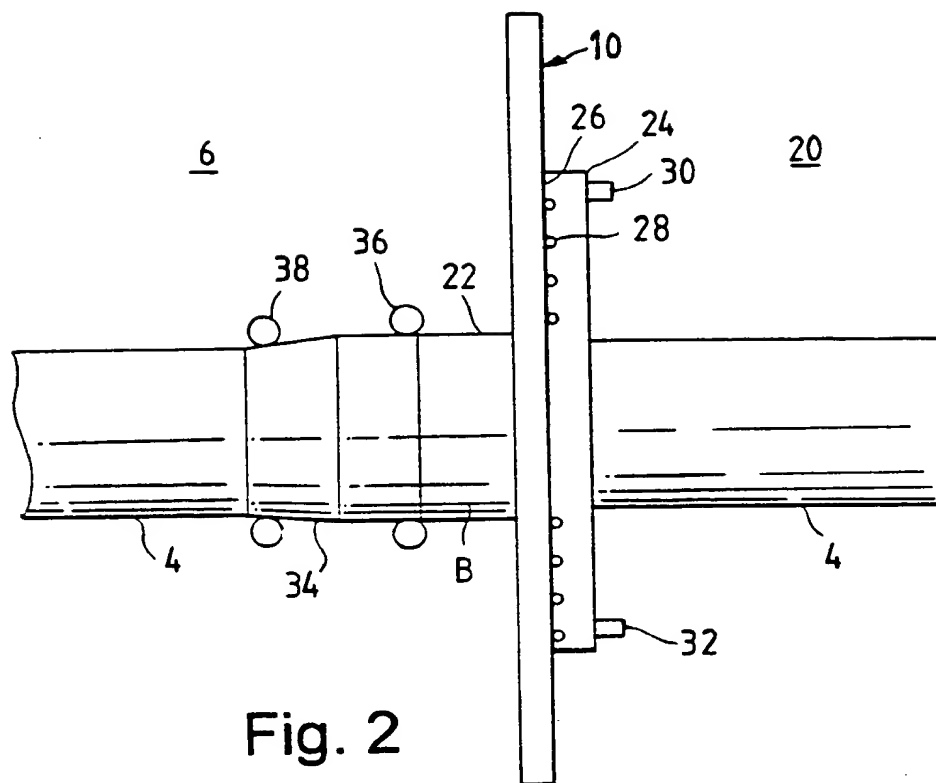


Fig. 2

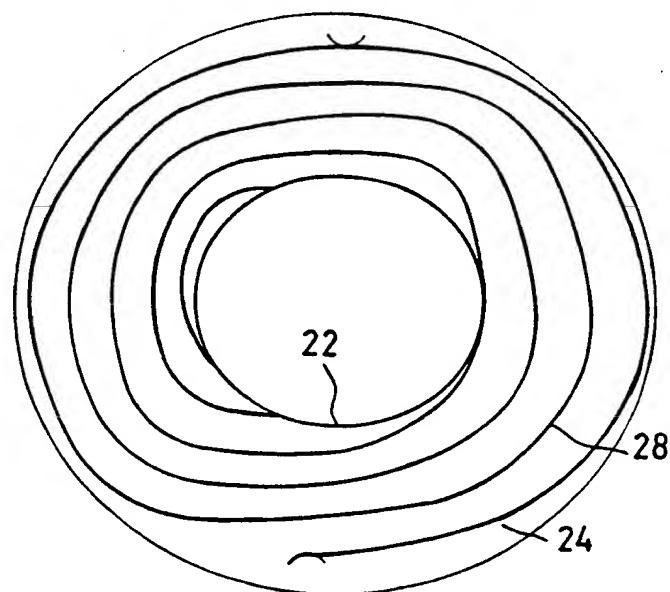


Fig. 3

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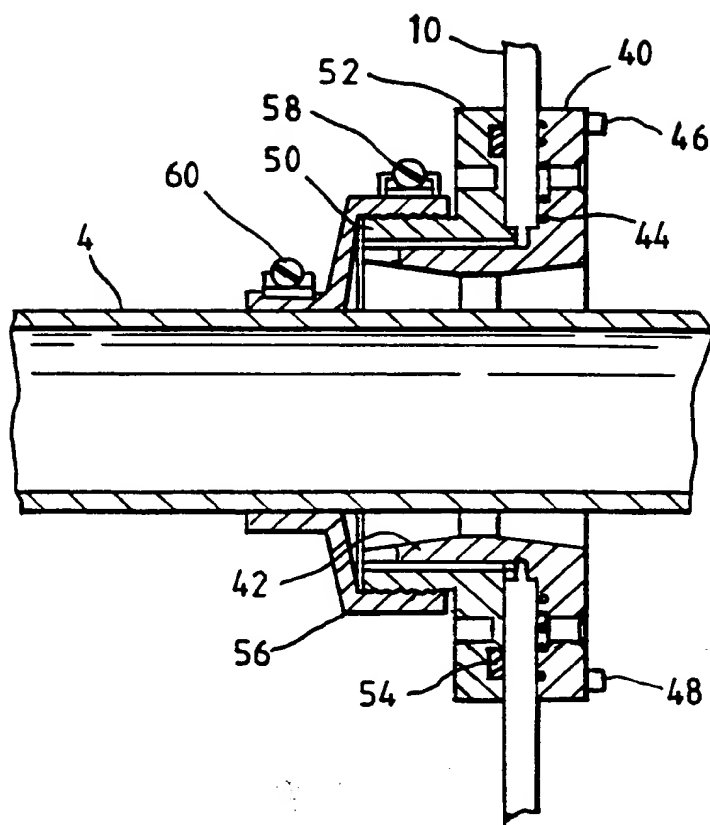


Fig. 4

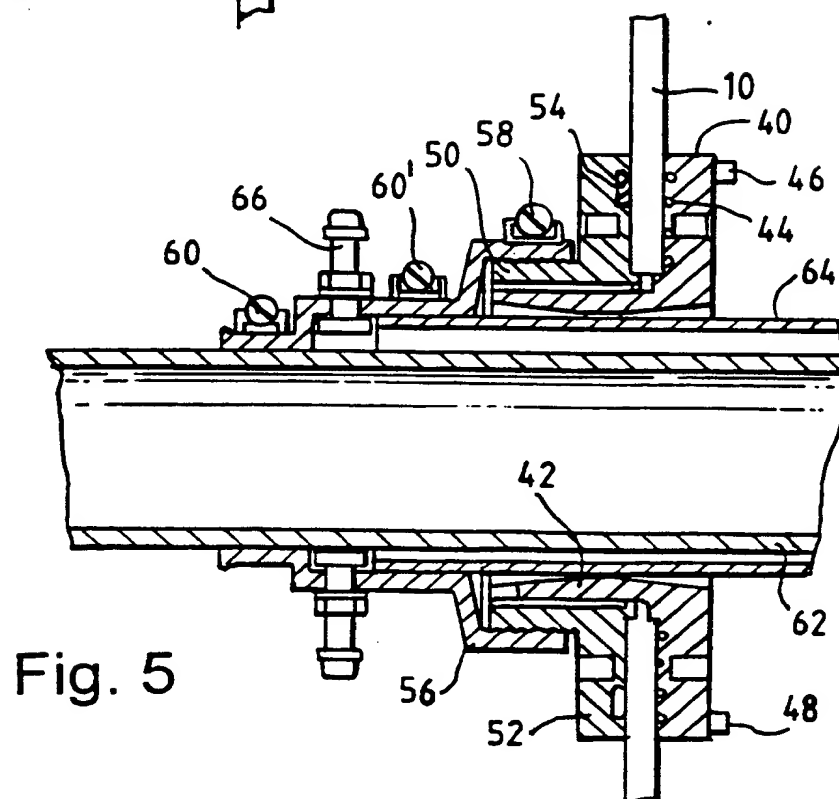
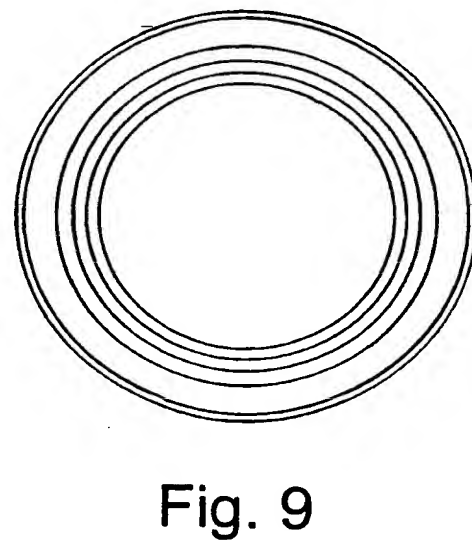
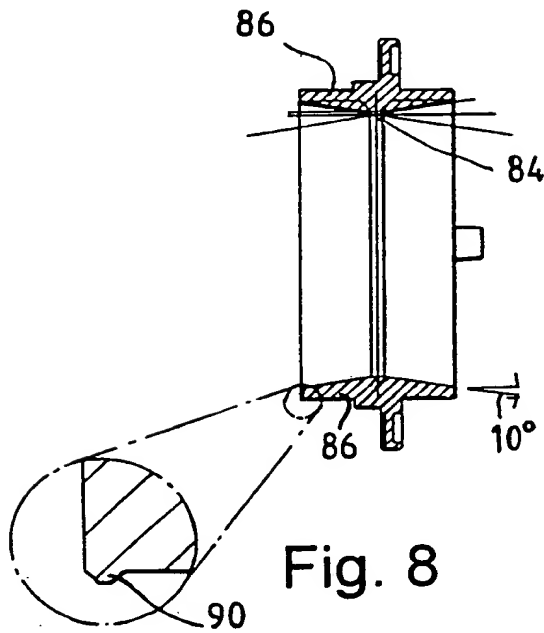
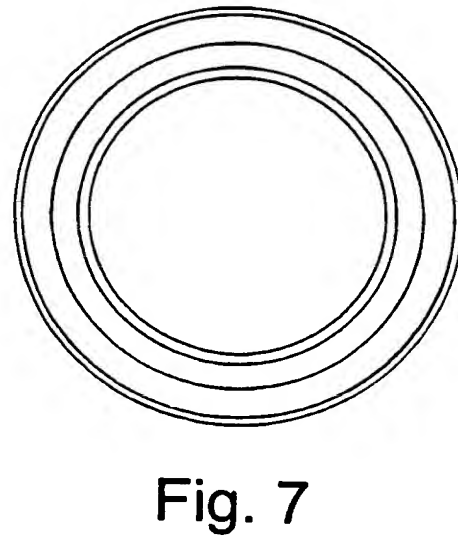
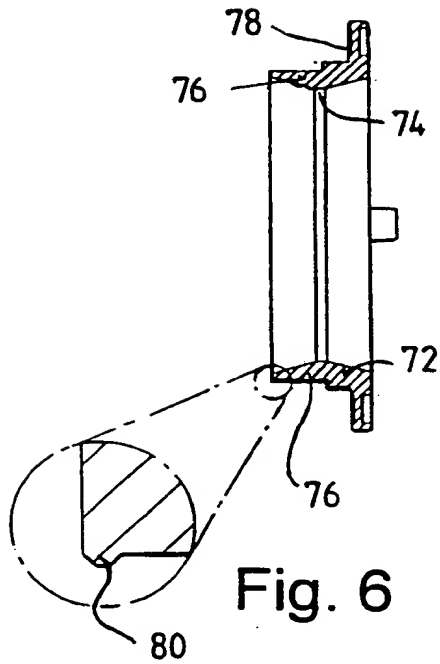


Fig. 5

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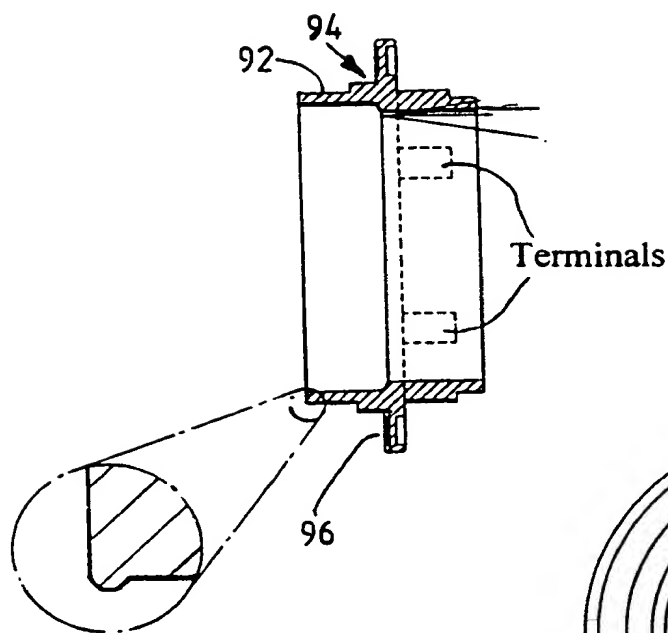
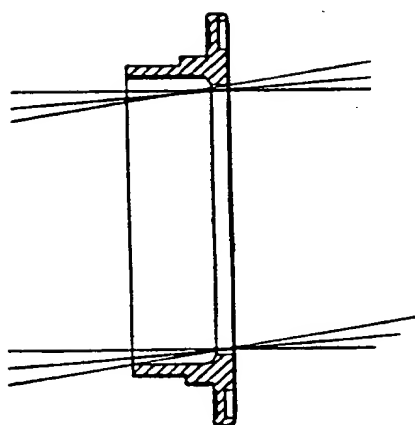
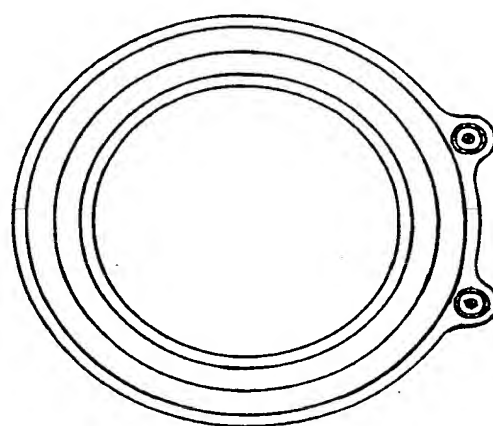
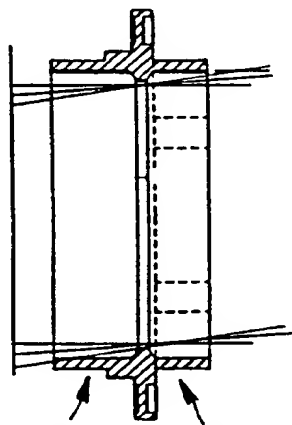


Fig. 10

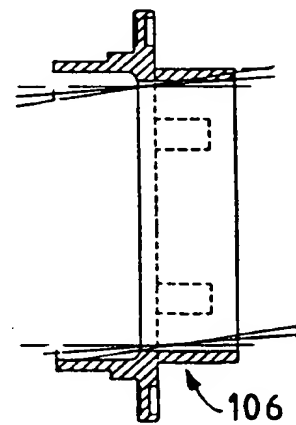
Fig. 12



Option 1
Weld on outside
of chamber



Option 2
Weld on either side
of chamber

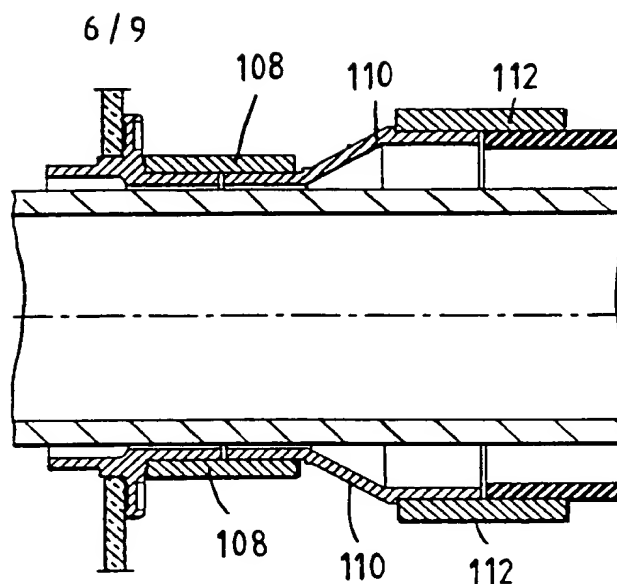


Option 3
Electro - Fusion
Socket on outside

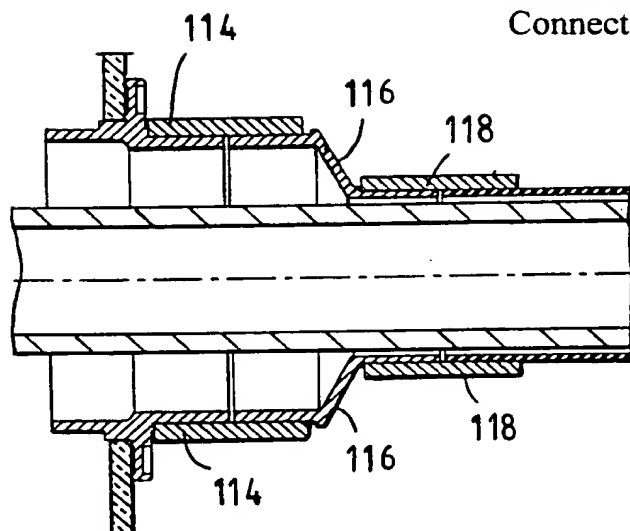
Fig. 11

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Fig. 13

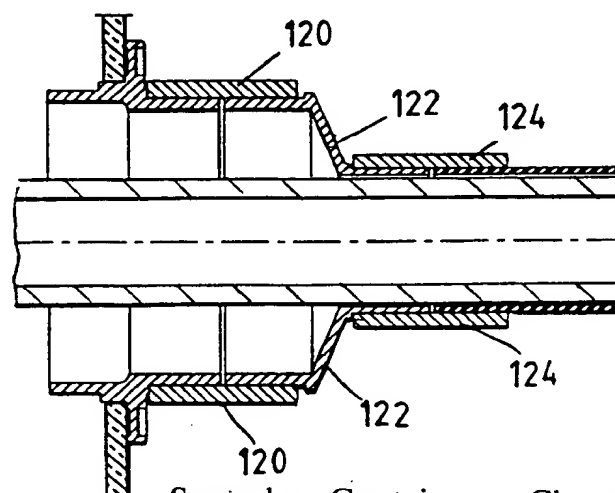


Secondary Containment Chamber
Connection of 160/110 and 160/90 Pipe



Secondary Containment Chamber
Connection of 75/63 Pipe

Fig. 15



Secondary Containment Chamber
Connection of 63/54 Pipe

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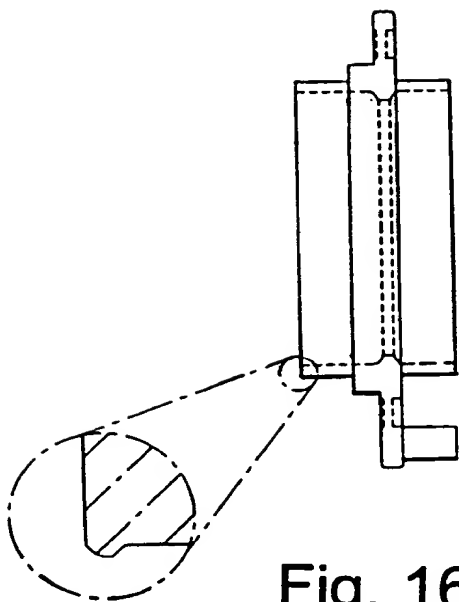


Fig. 16

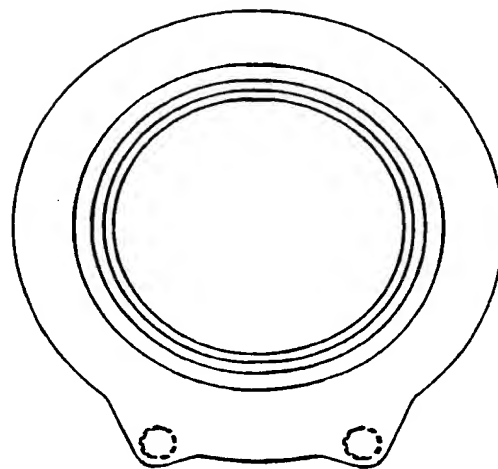


Fig. 17

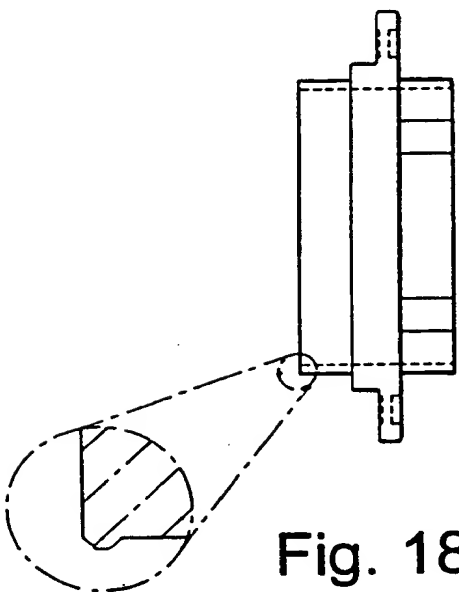


Fig. 18

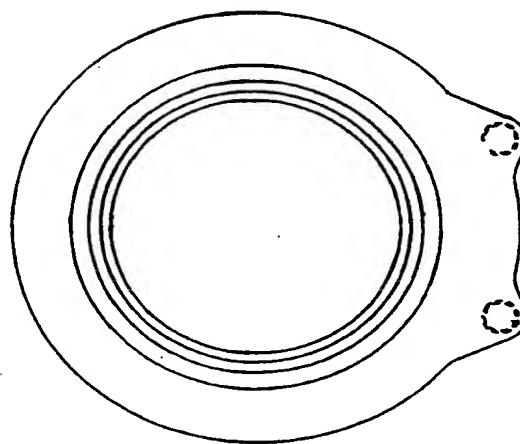


Fig. 19

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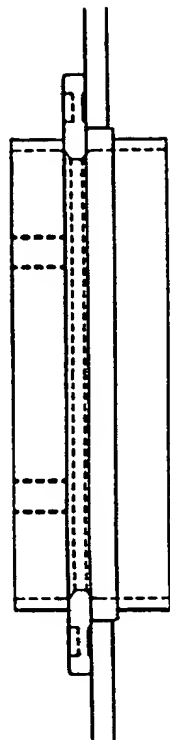


Fig. 20

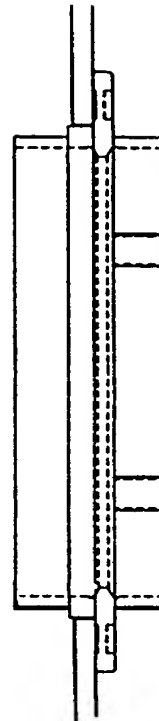


Fig. 21

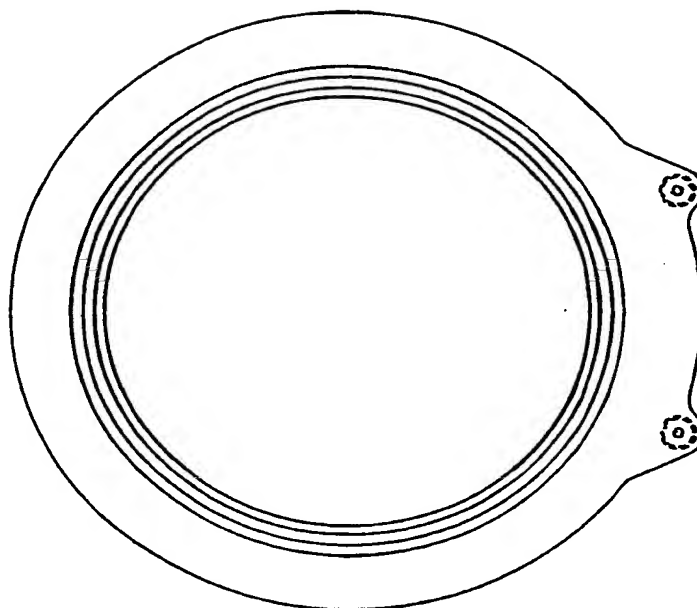


Fig. 22

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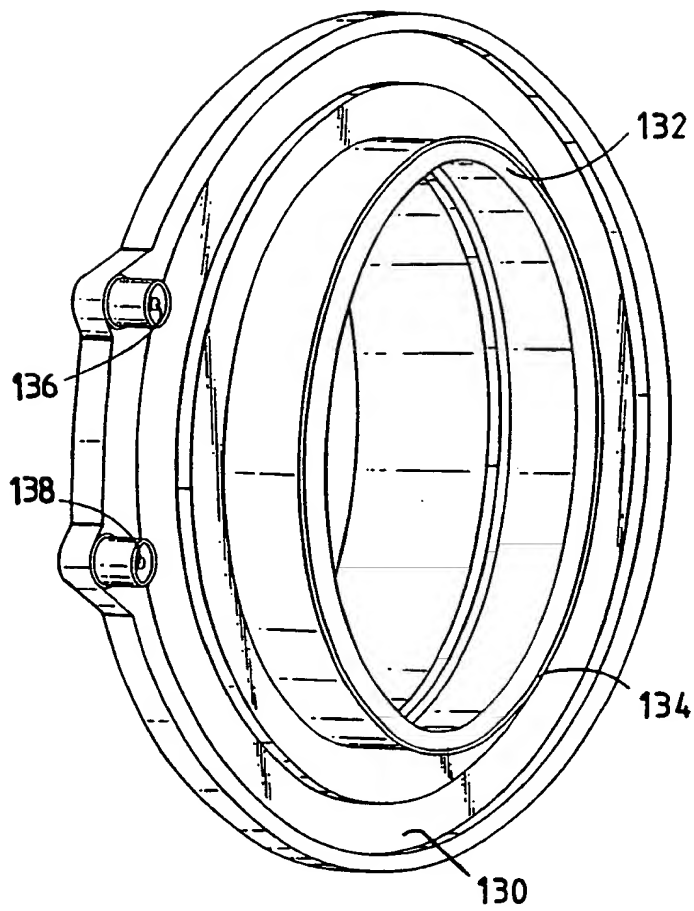


Fig. 23

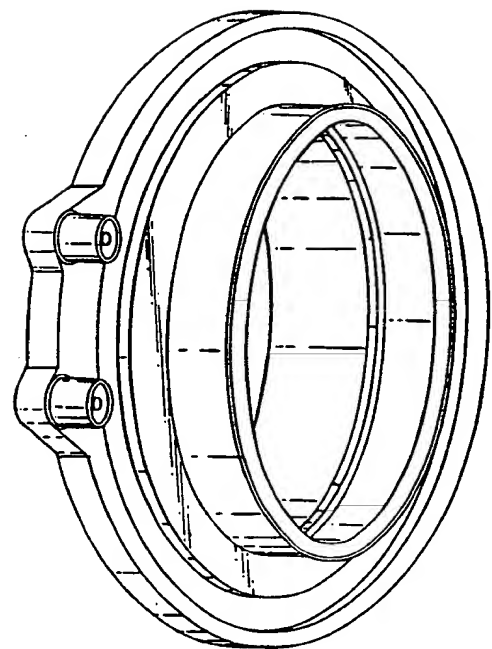


Fig. 24

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03698

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F16L47/02 F16L13/007

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 195 08 188 A (TROLINING GMBH) 12 September 1996 see the whole document ---	1-17
A	EP 0 190 810 A (DUROTAN ROR A S) 13 August 1986 see abstract -----	1-3

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

8 February 1999

Date of mailing of the international search report

15/02/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Schaeffler, C

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/03698

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19508188 A	12-09-1996	AU 5103496 A	02-10-1996
		DE 19680126 D	11-12-1997
		WO 9628685 A	19-09-1996
		EP 0813666 A	29-12-1997
EP 0190810 A	13-08-1986	DK 54986 A	09-08-1986

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

COATES, Ian, Harold
Sommerville & Rushton
45 Grosvenor Road
St Albans
Herts AL1 3AW
GRANDE BRETAGNE

RECEIVED

17 MAR 2000

S & R

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

15.03.2000

Applicant's or agent's file reference
PA 3247 PCT/INT

IMPORTANT NOTIFICATION

International application No.
PCT/GB98/03698

International filing date (day/month/year)
10/12/1998

Priority date (day/month/year)
10/12/1997

Applicant

PETROTECHNIK LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office
D-80298 Munich
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Authorized officer

Rinder, K

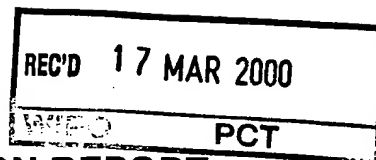
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PATENT COOPERATION TREATY

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PA 3247 PCT/INT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB98/03698	International filing date (day/month/year) 10/12/1998	Priority date (day/month/year) 10/12/1997
International Patent Classification (IPC) or national classification and IPC F16L47/02		
Applicant PETROTECHNIK LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 13/03/1999	Date of completion of this report 15.03.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Durrenberger, X Telephone No. +49 89 2399 2755



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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB98/03698

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1,2,4-6,8-14	as originally filed	
3,7	with telefax of	29/02/2000

Claims, No.:

1-16	with telefax of	29/02/2000
------	-----------------	------------

Drawings, sheets:

1/9-9/9*	as originally filed
----------	---------------------

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB98/03698

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-16
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-16
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

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Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1). The subject-matter of claim 1 concerns a fitting suitable for providing a fluid-tight seal between an opening in a chamber wall and a pipe.

This fitting comprises a flange, energy transfer means, and a tubular sleeve that extends on both sides of the flange.

None of the available prior art documents discloses all the features of claim 1, the subject-matter of claim 1 is therefore new, claim 1 fulfils the provisions of article 33(2) PCT.

The closest prior art appears to be the document DE 195 08 188 A, it discloses a fitting according to the preamble of claim 1. The subject-matter of claim 1 differs from that document in that the tubular sleeve of the fitting extends on both sides of the flange. The technical effect thereby achieved is to allow the fitting to be positioned on the inside or the outside of the chamber wall.

None of the available prior art documents discloses such a feature or gives a hint upon achieving this technical effect, the subject-matter of claim 1 can therefore be considered as involving an inventive step, claim 1 fulfils the provisions of article 33(3) PCT.

Dependent claims 2 to 10 add further constructional features to the fitting of claim 1 and relate also to new and inventive subject-matter.

- 2). Independent method claim 11 concerns the use of the new and inventive fitting of claim 1 and relates therefore also to new and inventive subject-matter. Claim 11 fulfils the provisions of article 33(2) and (3) PCT.

Dependent claims 12 to 16 add further method steps to the new and inventive method of claim 11, their subject-matter is therefore also new and inventive.

- 3). The subject-matter of all the claims is susceptible of industrial application.

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB98/03698

Re Item VII

Certain defects in the international application

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D 195 08 188 A is not mentioned in the description, nor is this document identified therein.

The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

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- (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;
- 5 (iii) an energy transfer means situated at or near the first surface of the flange, said energy transfer means being adapted to heat the first surface of the flange in order to form a substantially fluid tight seal;
- characterised in that the tubular sleeve extends from both sides of the flange such that, in use, the fitting can be positioned on the inside or outside of the chamber wall.
- 10

It is believed that water which leaks through conventional fittings and seals does not pass between the sealing member, for example the rubber gasket seal, and the pipe, but instead passes between the fitting and the wall. By contrast, the present invention provides a fitting which, when installed, is sealed to the wall around the aperture, and which does not require attachment to the wall by any invasive method, for example bolts, which would require further apertures in the wall. Thus, a seal formed using a fitting in accordance with the present invention should be substantially watertight or at least far more effective than the seals provided by conventional fittings.

15

20

Preferably, the first surface comprises a fusible material, such as a thermoplastic (for example polyethylene) which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.

Preferably, the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the surface.

25

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Figures 16 to 22 show various other configurations of fittings;

Figures 23 and 24 show perspective views of a preferred embodiment;

those figures which illustrate a fitting where the sleeve extends from just one side of the flange are included for background information only.

5 Definitions

In this context the following terms have the meanings given below in addition to their ordinary dictionary meanings:-

10 chamber – any receptacle designed to keep a fluid in or out. This includes, but is not limited to manhole and sump chambers as described herein. It also includes tanks in general.

energy transfer means – a generic term describing any form of energy source. Typically it takes the form of a resistance winding which heats up when an electrical current is passed through it. The term also encompasses other welding techniques including ultrasonic welding and induction welding.

15 flange – any collar suitable for attaching a fitting to a chamber wall. In the examples given the surface of the flange which contacts the chamber wall is substantially planar. However, it will be understood that the flange must conform to the profile of the chamber wall around the pipe inlet opening. Thus the flange can adopt any suitable conformation to achieve the necessary contact with a flat or curved surface
20 or even the corner of a container wall.

fluid – whilst the examples provided relate mainly to liquids, the term fluid refers to liquids, vapours and gases. For example, should a leak occur in a secondarily contained pipe in a garage forecourt installation then petrol or petrol vapour will collect in the manhole chamber. It is essential that this petrol vapour cannot escape
25 through the wall of the chamber and into the surrounding ground.

pipe – the examples given herein are for a generally circular cross-sectioned single wall pipe. However, the invention also covers other cross-sections such as box

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Claims

1. A fitting for providing a substantially fluid-tight seal between an opening in a chamber wall and a pipe passing through said opening, said fitting comprising:-
- 5 (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;
- 10 (iii) an energy transfer means situated at or near the first surface of the flange, said energy transfer means being adapted to heat the first surface of the flange in order to form a substantially fluid tight seal;
- characterised in that the tubular sleeve extends from both sides of the flange such that, in use, the fitting can be positioned on the inside or outside of the chamber
- 15 wall.
2. A fitting according to Claim 1, in which the first surface comprises a fusible material which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.
3. A fitting according to either Claim 1 or claim 2, in which the energy transfer
- 20 means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the first surface.
4. A fitting according to Claim 1 or Claim 3 when dependent on Claim 1, in which the fitting is adapted for use with a wall which is of a material which is not
- 25 suitable for being attached to the fitting by electrofusion, the first surface of the fitting incorporating an adhesive of a type which is activated by heat, wherein the heating

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of the first surface by the energy transfer means activates the adhesive and thereby bonds the fitting to the wall.

5. A fitting according to Claim 4, in which the adhesive is selected from a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive.

5 6. A fitting according to any preceding claim in which the conduction means comprises a heating wire which is embedded within the first surface.

7. A fitting according to any preceding claim, in which the sleeve is of a substantially circular cross-section, and the flange is radial.

8. A fitting according to Claim 3 or Claim 6, in which the fitting includes
10 terminals for connecting the conduction means to a current supply.

9. A fitting according to any preceding claim wherein the fitting further comprises a sealing member or boot adapted to form a fluid tight seal between the sleeve and the pipe.

10. A fitting and sealing member according to Claim 9, in which the sealing
15 member is resilient, and there is provided clamping means for clamping the sealing member to the pipe and/or the sleeve.

11. A method of forming a seal between an opening in a chamber wall and a pipe passing through said opening, the method comprising the steps of:-

- (a) applying a fitting to the pipe, said fitting comprising:-
- 20 (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first
25 surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;

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- (iii) an energy transfer means situated at or near the first surface of the flange, said energy transfer means being adapted to heat the first surface of the flange in order to form a substantially fluid tight seal;
- 5 characterised in that the tubular sleeve extends from both sides of the flange such that, in use, the fitting can be positioned on the inside or outside of the chamber wall;
- (b) applying energy to the energy transfer means and thereby heating the first surface and, optionally, the portion of the wall of the chamber
- 10 in the vicinity of the flange to cause the fitting to become fused or bonded to the chamber wall in a fluid tight manner;
- (c) applying a sealing member or boot to form a fluid tight seal between the sleeve and the pipe.
12. A method according to Claim 11, in which said heating is achieved by passing an electric current through conduction means located at or near the first surface of the flange.
- 15 13. A method according to Claim 11 or Claim 12, in which the materials constituting the wall and the surface are such that the surfaces are fused together by a process of electrofusion.
- 20 14. A method according to Claim 11 or Claim 12, in which the method also includes providing an adhesive which is activated by said heating to cause the fitting to be bonded to the wall.
15. A method according to Claim 14, in which the adhesive is incorporated into the first surface on the flange.
- 25 16. A method according to any of Claims 11 to 15, in which the wall comprises a manhole chamber wall for a subterranean fuel tank.

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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For _____ ing Office use only _____

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference

(if desired) (12 characters maximum) PA 3247 PCT /INT

Box No. I TITLE OF INVENTION

IMPROVEMENTS IN AND RELATING TO PIPE FITTINGS

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

PETROTECHNIK LIMITED
Maitland Road
Lion Barn Business Park
Needham Market
Ipswich
Suffolk IP6 8NZ GB

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant for the purposes of:

☐ all designated States☒ all designated States except the United States of America☐ the United States of America only☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

WRIGHT, Wayne Clifton Augustus
Shekinah
29 Cornwallis Avenue
Linton
Maidstone
Kent ME 17 4BW GB

This person is:

☐ applicant only☒ applicant and inventor☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant for the purposes of:

☐ all designated States☐ all designated States except the United States of America☒ the United States of America only☐ the States indicated in the Supplemental Box☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

COATES, Ian Harold
Somerville & Rushton
45 Grosvenor Road
St Albans
Hertfordshire
AL1 3AW GB

Telephone No.

01727 854215

Facsimile No.

01727 868868

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

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Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

BOUDRY, John Alexandre
Poplar Farm
Buxhall Road
Brettenham
Suffolk IP7 7PA
GB

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

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☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

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Box No.V DESIGNATION STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):


- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
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| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MW Malawi |
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| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TM Turkmenistan |
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| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
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| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
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| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
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- ☒ Grenada
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Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 10 December 1997	9726154.9	UK		
item (2)				
item (3)				
<input checked="" type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):				
<small>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</small>				
Box No. VII INTERNATIONAL SEARCHING AUTHORITY				
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority)		
ISA /		Date (day/month/year)	Number	Country (or regional Office)
Box No. VIII CHECK LIST: LANGUAGE OF FILING				
This international application contains the following number of sheets:		This international application is accompanied by the item(s) marked below:		
request : 4		1. <input checked="" type="checkbox"/> fee calculation sheet		
description (excluding sequence listing part) : 14		2. <input type="checkbox"/> separate signed power of attorney		
claims : 4		3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:		
abstract : 1		4. <input type="checkbox"/> statement explaining lack of signature		
drawings : 11		5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):		
sequence listing part of description : _____		6. <input type="checkbox"/> translation of international application into (language):		
Total number of sheets : 34		7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material		
		8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form		
		9. <input type="checkbox"/> other (specify):		
Figure of the drawings which should accompany the abstract:		Language of filing of the international application: English		
Box No. IX SIGNATURE OF APPLICANT OR AGENT				
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).				
 Dr Ian H Coates				
10 December 1998				

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1. Date of actual receipt of the purported international application:	2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.

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